Citation:

He FJ, Markandu ND, Coltart R, Barron J, MacGregor GA. Effect of short-term supplementation of potassium chloride and potassium citrate on blood pressure in hypertensives.. *Hypertension.* 2005 Apr;45(4):571-4.

PubMed ID: 15723964

Study Design:

Randomized cross-over trial

Class:

A - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

The objective was to compare the effect on blood pressure of potassium chloride with potassium citrate (form of potassium found in fruits and vegetables).

Inclusion Criteria:

- essential hypertension (systolic ≥140 mm Hg and/or diastolic ≥90mmHg
- had not received previous treatment or,
- for patients using diuretics, treatment had been stopped for at least 4 weeks or 8 weeks

Exclusion Criteria:

Individuals with

- secondary cause of hypertension
- malignant hypertension
- renal failure
- ischemic heart disease
- cerebrovascular disease
- pregnancy
- diabetes mellitus
- those who were using oral contraceptives or any other drugs

Description of Study Protocol:

Recruitment Patients were referred by local general practitioners.

Design: randomized crossover trial

Blinding used (if applicable) NA

Intervention (if applicable)

- Individuals were randomized to receive either potassium chloride (KCl) or potassium citrate (K-cit) for one week.
- This was followed by a one week washout
- They then received the other treatment for one additional week.
- Individuals were advised to maintain their dietary habits and lifestyle and to avoid intense physical exercise throughout the study.

Statistical Analysis Paired *t*-tests were used to compare the difference in continuous variables between the two study periods.

Data Collection Summary:

Timing of Measurements

Baseline, and after each intervention week: assessment included blood pressure (using standard equipment and following standard procedures), body weight, plasma and urinary electrolytes. Subjects' baseline measurements were taken.

Dependent Variables

- Blood pressure (using standard equipment and techniques): mean of 3 readings at 1-2 minute intervals
- Plasma and urinary potassium: 24 hour urine collection

Independent Variables

- Potassium chloride (96 mmol/day) (12 Slow-K tabs) and potassium citrate (96 mmol/day)(34 mL potassium citrate liquid)

Control Variables

Description of Actual Data Sample:

Initial N: 14

Attrition (final N): 14

Age: Mean age 51±9 years

Ethnicity: 11 men (9 white) and 3 women (2 white)

Other relevant demographics: none specified

Anthropometrics Mean BMI (SD): 29.9±5 kg/m^2

Location: London UK

Summary of Results:

Key findings:

- Baseline blood pressure (BP) was 151±16/93±7 mm Hg; urinary potassium (K) 81±24 mmol.
- On day 7 of KCl, BP was 140±12/88±7 mm Hg, with urinary K 164±36 mmol.
- On day 7 of K-cit, BP was 138±12.88±6 mm Hg, with urinary K 160±33 mmol.
- BP was significantly lower compared with baseline (KCl: systolic $P<0.001$, diastolic $P<0.01$; K-cit: systolic $P<0.01$, diastolic $P<0.05$), but there was no significant difference in BP between KCl and K-cit.
- Baseline plasma K was 4.2±0.3 mmol/L. Plasma K was 4.6±0.3 mmol/L with K chloride and 4.6±0.3 mmol/L with K citrate. Values were significantly higher than at baseline ($P<0.001$), but there was no significant difference between treatments.

Author Conclusion:

This study suggests that in patients with essential hypertension, KCl and K-cit have a similar effect on BP, supporting an increase in K intake. Potassium does not need to be given in the form of KCl to lower BP. Increasing the consumption of foods high in K is likely to have the same effect on BP as KCl.

Reviewer Comments:

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes

1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	N/A
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	N/A
4.4.	Were reasons for withdrawals similar across groups?	N/A

4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	Yes
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes

7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	N/A
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	N/A
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes